

What is claimed is:

1. A video data multiplexing device comprising:

a plurality of encoding means for encoding program data respectively including video data, outputting resultant encoded streams, generating statistical multiplexing data required for control using statistical multiplexing, and outputting the generated data on the same transmission channels as the encoded streams are transmitted;

multiplexing means for acquiring the encoded streams and the statistical multiplexing data from the respective encoding means via the transmission channels, and multiplexing and outputting them; and

encoding control means for acquiring the statistical multiplexing data of each encoding means from output of the multiplexing means, and conducting control using statistical multiplexing on each encoding means on the basis of the statistical multiplexing data.

2. A video data multiplexing device according to claim 1, wherein the encoding means forms the encoded stream and the statistical multiplexing data respectively as packets and outputs the packets.

3. A video data multiplexing device according to claim 1, wherein the multiplexing means includes statistical multiplexing data removing means for removing the statistical multiplexing data out of data obtained by multiplexing the encoded streams and the statistical multiplexing data supplied from the respective encoding means, and outputting resultant data to a transmission channel of a subsequent stage, and the multiplexing means

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outputs the data including the statistical multiplexing data to the encoding control means without passing through the statistical multiplexing data removing means.

4. A video data multiplexing device according to claim 2, wherein the packet of the statistical multiplexing data includes identification data for identifying from which encoding means the statistical multiplexing data is supplied.

5. A video data multiplexing device according to claim 4, wherein the packet of the statistical multiplexing data further includes data for rejection detection used for detecting whether packet rejection is present or not.

6. A video data multiplexing control method used in a video data multiplexing device including a plurality of encoding means for encoding program data respectively including video data and outputting encoded streams, multiplexing means for multiplexing the encoded streams outputted from controlling each of the encoding means, and encoding control means for controlling each of the encoding means, wherein control using statistical multiplexing is conducted on each of the encoding means by the encoding control means, comprising:

a statistical multiplexing data output procedure in the encoding means for generating statistical multiplexing data required for control using statistical multiplexing, and outputting the generated data on the same transmission channels as the encoded streams are transmitted;

a multiplexing procedure in the multiplexing means for acquiring the encoded streams and the statistical multiplexing data from the

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el } respective encoding means via the transmission channels, and multiplexing and outputting them; and

an encoding control procedure in the encoding control means for acquiring the statistical multiplexing data of the respective encoding means from output of the multiplexing means, and conducting control using statistical multiplexing on the respective encoding means on the basis of the statistical multiplexing data.

7. A video data multiplexing control method according to claim 6, wherein in the statistical multiplexing data output procedure, the statistical multiplexing data is formed as a packet and outputted.

8. A video data multiplexing control method according to claim 6, wherein the video data multiplexing control method further includes a statistical multiplexing data removing procedure for removing the statistical multiplexing data out of data multiplexed by the multiplexing procedure and outputting resultant data to a transmission channel of a subsequent stage, in the multiplexing means.

9. A video data multiplexing control method according to claim 7, wherein the packet of the statistical multiplexing data includes identification data for identifying from which encoding means the statistical multiplexing data is supplied.

10. A video data multiplexing control method according to claim 9, wherein the packet of the statistical multiplexing data further includes data for rejection detection used for detecting whether packet rejection is present or not.

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11. A video data multiplexing device comprising:

a plurality of encoding means for encoding program data respectively including video data, outputting resultant encoded streams, generating statistical multiplexing data required for control using statistical multiplexing, and outputting the generated data on the same transmission channels as the encoded streams;

multiplexing means for acquiring the encoded streams and the statistical multiplexing data from the respective encoding means via the transmission channels, conducting multiplexing processing on the encoded streams and the statistical multiplexing data at a first rate greater than a data transmission rate on a transmission channel of a subsequent stage, outputting first data including the statistical multiplexing data, conducting multiplexing processing on data obtained by removing the statistical multiplexing data from the data outputted from the respective encoding means, at a second rate equal to a data transmission rate on the transmission channel of the subsequent stage, and outputting second data which does not include the statistical multiplexing data to the transmission channel of the subsequent stage; and

encoding control means for acquiring the statistical multiplexing data of the respective encoding means from the first data outputted from the multiplexing means, and conducting control using statistical multiplexing on the respective encoding means on the basis of the statistical multiplexing data.

12. A video data multiplexing device according to claim 11, wherein the

encoding means forms the encoded streams and the statistical multiplexing data respectively as packets and outputs the packets.

13. A video data multiplexing device according to claim 11, wherein the multiplexing means includes a multiplexing unit for acquiring the encoded streams and the statistical multiplexing data from the respective encoding means via the transmission channels, and multiplexing them, a first multiplexing control unit for controlling the multiplexing unit so that the first data may be outputted from the multiplexing unit at the first rate, and holding data obtained by removing the statistical multiplexing data from the first data outputted from the multiplexing unit, and a second multiplexing control unit for controlling the first multiplexing control unit so that the data held by the first multiplexing control unit may be outputted to the transmission channel of the subsequent stage at the second rate as the second data.

14. A video data multiplexing control method used in a video data multiplexing device including a plurality of encoding means for encoding program data respectively including video data and outputting encoded streams, multiplexing means for multiplexing the encoded streams outputted from controlling each of the encoding means, and encoding control means for controlling each of the encoding means, wherein control using statistical multiplexing is conducted on each of the encoding means by the encoding control means, comprising:

a statistical multiplexing data output procedure in the encoding means for generating statistical multiplexing data required for control using

statistical multiplexing, and outputting the generated data on the same transmission channel as the encoded streams are transmitted;

a multiplexing procedure in the multiplexing means for acquiring the encoded streams and the statistical multiplexing data from the respective encoding means via the transmission channels, conducting multiplexing processing on the encoded streams and the statistical multiplexing data at a first rate greater than a data transmission rate on a transmission channel of a subsequent stage, outputting first data including the statistical multiplexing data, conducting multiplexing processing on data obtained by removing the statistical multiplexing data from the data outputted from the respective encoding means, at a second rate equal to a data transmission rate on the transmission channel of the subsequent stage, and outputting second data which does not include the statistical multiplexing data to the transmission channel of the subsequent stage; and

an encoding control procedure in the encoding control means for acquiring the statistical multiplexing data of the respective encoding means from the first data outputted from the multiplexing means, and conducting control using statistical multiplexing on the respective encoding means on the basis of the statistical multiplexing data.

15. A video data multiplexing control method according to claim 14, wherein in the statistical multiplexing data output procedure, the statistical multiplexing data is formed as packets and outputted.

16. An encoded stream multiplexing device for multiplexing encoded streams, comprising:

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a plurality of encoding means for respectively encoding video data of a plurality of channels on the basis of target encoding rates and outputting encoded video streams;

encoding control means for computing the target encoding rates supplied to the plurality of encoding means for the respective channels; and

multiplexing means for multiplexing a plurality of encoded streams respectively outputted from the plurality of encoding means,

wherein the plurality of encoding means output the encoded video streams as video transport stream packets, and output encoding difficulty information indicating encoding difficulties in encoding video data of the plurality of channels as private transport stream packets,

the multiplexing means includes a multiplexing circuit for receiving a plurality of transport streams including the video transport stream packets and the private transport stream packets respectively from the plurality of encoding means, multiplexing the plurality of transport streams, and thereby generating a multiplexed transport stream, and

the encoding control means receives the multiplexed transport stream from the multiplexing means, extracts the private transport stream packets included in the multiplexed transport stream, and computes the target encoding rates respectively corresponding to the plurality of channels on the basis of the encoding difficulty information described in the extracted private transport stream packets.

17. An encoded stream multiplexing device according to claim 16, wherein the multiplexing means further includes private packet removing means for

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removing the private transport stream packets from the multiplexed transport stream, and generating a multiplexed transport stream which does not include the private transport stream packets.

18. An encoded stream multiplexing device according to claim 17, wherein in a header of each transport stream packet included in the transport stream, a packet identifier representing a kind of data included in the transport stream packet is described, and

the private packet removing means compares a packet identifier of each transport stream packet included in the multiplexed transport stream with a unique packet identifier set for each private transport stream packet, and thereby removes the private transport stream packet from the multiplexed transport stream.

19. An encoded stream multiplexing device according to claim 18, wherein the private packet removing means controls output timing of each transport stream packet included in the multiplexed transport stream with the private transport stream packets removed therefrom so as to eliminate vacant time slots generated by removing the private transport stream packets.

20. An encoded stream multiplexing device according to claim 16, wherein the encoding control means computes temporary encoding rates respectively corresponding to the plurality of channels from the plurality of pieces of encoding difficulty information transmitted by the private transport stream packets, and computes the target encoding rates from the temporary encoding rates so as to make a sum total of the temporary encoding rates equal to or less than a transmission rate.

21. An encoded stream multiplexing device for multiplexing encoded streams, comprising:

a plurality of encoding means for respectively encoding video data of a plurality of channels on the basis of target encoding rates, thereby generating encoded video streams, outputting the encoded video streams as video transport stream packets, outputting encoding difficulty information indicating encoding difficulties in encoding video data of the plurality of channels as private transport stream packets;

multiplexing means for receiving a plurality of transport streams including the video transport stream packets and the private transport stream packets respectively from the plurality of encoding means, multiplexing the plurality of transport streams, and thereby generating a multiplexed transport stream; and

encoding control means for receiving the multiplexed transport stream from the multiplexing means, extracting the private transport stream packets included in the multiplexed transport stream, computing the target encoding rates respectively corresponding to the plurality of channels on the basis of the encoding difficulty information described in the extracted private transport stream packets, supplying the computed target encoding rates respectively to the plurality of encoding means, and thereby controlling rates of the encoded streams outputted from the plurality of encoding means.

22. An encoded stream multiplexing device according to claim 21, wherein the multiplexing means further includes a private packet removing means for removing the private transport stream packets from the multiplexed

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transport stream, and generating a multiplexed transport stream which does not include the private transport stream packets.

23. An encoded stream multiplexing device according to claim 22, wherein in a header of each transport stream packet included in the transport stream, a packet identifier representing a kind of data included in the transport stream packet is described, and

the private packet removing means compares the packet identifier of each transport stream packet included in the multiplexed transport stream with a unique packet identifier set for each private transport stream packet, and thereby removes the private transport stream packet from the multiplexed transport stream.

24. An encoded stream multiplexing device according to claim 23, wherein the private packet removing means controls output timing of each transport stream packet included in the multiplexed transport stream with the private transport stream packets removed therefrom so as to eliminate vacant time slots generated by removing the private transport stream packets.

25. An encoded stream multiplexing device according to claim 21, wherein the encoding control means computes temporary encoding rates respectively corresponding to the plurality of channels from the plurality of pieces of encoding difficulty information transmitted by the private transport stream packets, and computes the target encoding rates from the temporary encoding rates so as to make a sum total of the temporary encoding rates equal to or less than a transmission rate.

26. An encoded stream multiplexing method for multiplexing a plurality of

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Cl 1 } encoded streams generated by encoding video data of a plurality of channels, including the steps of:

encoding video data of the plurality of channels, generating a plurality of encoded streams, and calculating encoding difficulty information indicating encoding difficulties in encoding video data of the plurality of channels;

outputting the plurality of encoded streams as video transport stream packets, and outputting the encoding difficulty information as private transport stream packets;

respectively receiving a plurality of transport streams including the video transport stream packets and the private transport stream packets, multiplexing the plurality of transport streams, and thereby generating a multiplexed transport stream; and

receiving the multiplexed transport stream, extracting the private transport stream packets included in the multiplexed transport stream, and computing the target encoding rates respectively corresponding to the plurality of channels on the basis of the encoding difficulty information described in the extracted private transport stream packets.

27. An encoded stream multiplexing method according to claim 26, further comprising the step of removing the private transport stream packets from the multiplexed transport stream, and generating a multiplexed transport stream which does not include the private transport stream packets.

28. An encoded stream multiplexing method according to claim 27, wherein in a header of each transport stream packet included in the transport stream,

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a packet identifier representing a kind of data included in the transport stream packet is described, and

a packet identifier of each transport stream packet included in the multiplexed transport stream is compared with a unique packet identifier set for each private transport stream packet, and thereby the private transport stream packets are removed from the multiplexed transport stream.

29. An encoded stream multiplexing method according to claim 28, wherein output timing of each transport stream packet included in the multiplexed transport stream with the private transport stream packets removed therefrom is controlled so as to eliminate vacant time slots generated by removing the private transport stream packets.

30. An encoded stream multiplexing method according to claim 26, wherein temporary encoding rates respectively corresponding to the plurality of channels are computed from the plurality of pieces of encoding difficulty information transmitted by the private transport stream packets, and the target encoding rates from the temporary encoding rates are computed so as to make a sum total of the temporary encoding rates equal to or less than a transmission rate.

31. An encoded stream multiplexing method for multiplexing a plurality of encoded streams, comprising:

a plurality of encoding steps for respectively encoding video data of a plurality of channels on the basis of target encoding rates, thereby generating encoded video streams, outputting the encoded video streams as

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al } video transport stream packets, outputting encoding difficulty information indicating encoding difficulties in encoding video data of the plurality of channels as private transport stream packets;

a multiplexing step for receiving a plurality of transport streams including the video transport stream packets and the private transport stream packets respectively from the plurality of encoding steps, multiplexing the plurality of transport streams, and thereby generating a multiplexed transport stream; and

an encoding control step for receiving the multiplexed transport stream from the multiplexing step, extracting the private transport stream packets included in the multiplexed transport stream, computing the target encoding rates respectively corresponding to the plurality of channels on the basis of the encoding difficulty information described in the extracted private transport stream packets, supplying the computed target encoding rates respectively to the plurality of encoding steps, and thereby controlling rates of the encoded streams outputted from the plurality of encoding steps.

32. An encoded stream multiplexing method according to claim 31, wherein the multiplexing step further includes a private packet removing step for removing the private transport stream packets from the multiplexed transport stream, and generating a multiplexed transport stream which does not include the private transport stream packets.

33. An encoded stream multiplexing method according to claim 32, wherein in a header of each transport stream packet included in the transport stream, a packet identifier representing a kind of data included in the transport

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stream packet is described, and

at the private packet removing step, a packet identifier of each transport stream packet included in the multiplexed transport stream is compared with a unique packet identifier set for each private transport stream packet, and thereby the private transport stream packets are removed from the multiplexed transport stream.

34. An encoded stream multiplexing method according to claim 33, wherein at the private packet removing step, output timing of each transport stream packet included in the multiplexed transport stream with the private transport stream packets removed therefrom is controlled so as to eliminate vacant time slots generated by removing the private transport stream packets.

35. An encoded stream multiplexing method according to claim 31, wherein at the encoding control step, temporary encoding rates respectively corresponding to the plurality of channels are computed from the plurality of pieces of encoding difficulty information transmitted by the private transport stream packets, and the target encoding rates from the temporary encoding rates are computed so as to make a sum total of the temporary encoding rates equal to or less than a transmission rate.

36. An encoding device for encoding video data of a plurality of channels, comprising:

a plurality of encoding means for respectively outputting a plurality of encoded video streams generated by encoding the video data of the plurality of channels as video transport stream packets, and outputting

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encoding difficulty information indicating encoding difficulties in encoding video data of the plurality of channels as private transport stream packets; and

encoding control means for computing the target encoding rates respectively corresponding to the plurality of channels on the basis of the encoding difficulty information described in the private transport stream packets outputted from the plurality of encoding means, supplying the computed target encoding rates respectively to the plurality of encoding means, and thereby controlling rates of the encoded streams outputted from the plurality of encoding means.

37. An encoding device according to claim 36, wherein the encoding control means computes temporary encoding rates respectively corresponding to the plurality of channels from the plurality of pieces of encoding difficulty information transmitted by the private transport stream packets, and computes the target encoding rates from the temporary encoding rates so as to make a sum total of the temporary encoding rates equal to or less than a transmission rate.

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38. An encoding method for encoding video data of a plurality of channels, including the steps of:

outputting a plurality of encoded video streams generated by encoding the video data of the plurality of channels by using a plurality of encoding means as video transport stream packets, and outputting encoding difficulty information indicating encoding difficulties in encoding video data of the plurality of channels as private transport stream packets; and

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computing the target encoding rates respectively corresponding to the plurality of channels on the basis of the encoding difficulty information described in the outputted private transport stream packets, supplying the computed target encoding rates respectively to the plurality of encoding means, and thereby controlling rates of the encoded streams outputted from the plurality of encoding means.

39. An encoding method according to claim 38, wherein temporary encoding rates respectively corresponding to the plurality of channels are respectively computed from the plurality of pieces of encoding difficulty information described in the private transport stream packets, and the target encoding rates are computed from the temporary encoding rates so as to make a sum total of the temporary encoding rates equal to or less than a transmission rate.

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